

**What is Claimed:**

1 1. An apparatus for rolling a luminal graft into a low profile configuration,  
2 comprising:

3 two cylindrical rollers rotationally mounted on parallel axes;

4 a continuous belt disposed on said rollers to form an inner loop  
5 defining a pocket and an outer loop circumscribing said rollers and said inner loop;

6 a mandrel disposed within said pocket to maintain said pocket and  
7 press said graft against said belt; and

8 a tensioning device, applying tension to said belt.

1 2. The apparatus of claim 1 wherein said mandrel comprises a floating cylindrical  
2 pin.

1 3. The apparatus of claim 2 wherein said tensioning device comprises a  
2 removable tension rod positioned within said pocket, pressing said mandrel toward  
3 said belt and pinching said graft against said mandrel.

1 4. The apparatus of claim 1 further comprising a spring biasing said rollers  
2 toward each other.

1 5. The apparatus of claim 2 wherein said tensioning device comprises a spring  
2 biasing said outer loop of said belt.

1 6. The apparatus of claim 1 wherein said mandrel is a portion of a delivery  
2 system for said graft.

1 7. The apparatus of claim 6 wherein said mandrel is a catheter.

1 8. The apparatus of claim 6 wherein said mandrel is a guide wire.

- 1 9. The apparatus of claim 3 further comprising a frame configured to position  
2 said axes of said rollers and to restrain said starter rod.
- 1 10. The apparatus of claim 9 further comprising a crank for rotating one of said  
2 rollers.
- 1 11. The apparatus of claim 10 wherein the said crank comprises an electric motor  
2 rotating upon its axis when triggered by a switch for compression and loading of  
3 said graft.
- 1 12. The apparatus of claim 1 further comprising a graft tension rod positioned in  
2 contact with the inner surface of said graft to maintain uniform tension along the  
3 length of said graft.
- 1 13. The apparatus of claim 12 wherein said graft is bifurcated having a first and  
2 second leg with a common trunk, and wherein said tension rod is positioned in  
3 contact with the inner surface of said trunk and said first leg to maintain uniform  
4 tension along the length of said trunk and said first leg, the apparatus further  
5 comprising a second tension rod positioned in contact with the inner surface of said  
6 second leg to maintain uniform tension along the length of said second leg.
- 1 14. The apparatus of claim 2 wherein said mandrel further comprises a removable  
2 lock for fixing said graft to said pin.
- 1 15. The apparatus of claim 13 wherein said pin is configured to have an undercut  
2 diameter along a portion of its axial length to accommodate said graft and wherein  
3 said lock comprises fingers restraining a portion of said graft in said undercut  
4 diameter.
- 1 16. A method of rolling a luminal graft into a low profile configuration, comprising  
2 the steps of:
  - 3 positioning a mandrel in contact with a surface of said graft;

4 placing said mandrel and a portion of said graft proximate a belt  
5 disposed on two essentially parallel cylindrical rollers;

6 positioning said rollers to form a pocket in said belt to retain said  
7 mandrel and said portion of said graft;

8 applying tension to said belt; and

9 rotating one of said rollers to roll said graft onto said mandrel.

1 17. The method of claim 16 further comprising the steps of:

2 introducing a temporary covering between said rollers after said graft is  
3 rolled onto said mandrel; and

4 continuing to rotate one of said rollers to roll temporary covering onto said  
5 graft.

1 18. The method of claim 16 wherein tension is applied to said graft while it is  
2 rolled onto said mandrel.

1 19. The method of claim 16 wherein said graft is a bifurcated graft having a main  
2 body in communication with two limbs, and said limbs are folded inside of said main  
3 body prior to rolling said graft onto said mandrel.

1 20. The method of claim 16 wherein said tension is applied to said belt by placing  
2 a tension rod into said pocket external to said graft.

1 21. The method of claim 16 wherein said tension is applied to said belt by a  
2 biasing device acting on said belt.

1 22. A rolled graft, comprising a generally tubular graft flattened against itself and  
2 rolled onto itself into a cylindrical configuration.

1 23. The rolled graft of claim 22 further comprising an aperture extending along  
2 the axis of said cylindrical rolled graft.

1 24. The rolled graft of claim 22 wherein said graft is rolled onto an axial member  
2 comprising a part of a delivery system by which said graft is deployed in a body  
3 lumen.

1 25. The rolled graft of claim 22 in combination with an expansion element  
2 disposed axially within said rolled graft.

1 26. The rolled graft of claim 22, wherein said graft includes a larger diameter  
2 main section and two smaller diameter sections at an axial end of said larger  
3 diameter section.

1 27 The rolled graft of claim 22 further comprising a temporary covering  
2 surrounding and restraining said graft in said cylindrical configuration.

1 28. The rolled graft of claim 27 wherein said temporary covering comprises  
2 perforations along its length, such that said temporary graft tears along said  
3 perforations when radially outward force is applied to said rolled graft.

1 29. The rolled graft of claim 27 wherein said temporary covering is absorbed after  
2 delivery into a body lumen.

1 30. The rolled graft of claim 27 wherein a flexible member is embedded in said  
2 temporary covering to fail said temporary covering after delivery into a body lumen.

1 31. A graft kit, comprising:

2 a low profile delivery system configured to deliver a rolled graft  
3 endoluminally; and

4 a plurality of differing grafts, each being compatible with a low profile delivery  
5 system, for selection of an optimal one of said plurality during a surgical procedure

6           at least one of said grafts comprising a low profile delivery configuration in  
7    which the graft is wrapped axially about itself.

1    32.    The kit of claim 31 further comprising an apparatus for rolling a selected one  
2    of said grafts into a low profile configuration for endoluminal delivery.

1    33.    The kit of claim 31 wherein all of said grafts are rolled grafts.

1    34.    An endoluminal graft delivery system, comprising:

2           a member configured to be advanced through a body lumen from an access  
3    to a location remote from said access; and

4           a graft rolled on its longitudinal axis into a low profile rolled graft  
5    configuration over said member and radially constrained on said member during  
6    advancement through said body lumen.

1    35.    The delivery system of claim 34 wherein said graft is permanently attached to  
2    a self-expanding stent associated with said member.

1    36.    The delivery system of claim 34 wherein said member is a guide wire.

1    37.    The delivery system of claim 34 wherein said member is a catheter.

1    38.    The delivery system of claim 34 wherein said member is a self-expanding  
2    stent.

1    39.    The delivery system of claim 34 wherein said member is an expandable stent.

1    40.    The delivery system of claim 34 wherein said member is a combination of one  
2    or more of a guide wire, a catheter, and a stent.

1    41.    The delivery system of claim 34 wherein said graft is radially constrained by a  
2    sheath, which is axially withdrawn to release, said graft.

1 42. The delivery system of claim 34 further comprising an expansion device  
2 disposed radially within said rolled graft.

1 43 The delivery system of claim 42 wherein said expansion device is a balloon.

1 44. The delivery system of claim 42 further comprising an inner sheath disposed  
2 between said expansion device and said rolled graft, said inner sheath being axially  
3 movable relative to said rolled graft.

1 45. The delivery system of claim 34 wherein said rolled graft is radially  
2 constrained by a temporary covering during advancement through said body lumen.

1 46. A method for delivering a luminal graft into a body lumen comprising the  
2 steps of:

3 rolling said graft upon itself into a low-profile rolled configuration;

4 restraining said graft in said rolled configuration;

5 endoluminally delivering said graft into a body lumen; and

6 applying radially outward force to said graft to expand said graft into a  
7 tubular, deployed configuration.

1 47. The method of claim 46 wherein the step of restraining said graft comprises  
2 applying a temporary covering surrounding said graft in said rolled configuration.

1 48. The method of claim 47 wherein said temporary covering comprises  
2 perforations along its length, and said radially outward force causes said temporary  
3 covering to tear along said perforations.

1 49. The method of claim 47, further comprising, prior to the step of applying  
2 radially outward force, the step of releasing said temporary covering.

1    50.    The method of claim 49 wherein the step of releasing said temporary covering  
2    comprises allowing said temporary covering to be absorbed into the body.

1    51.    The method of claim 49 wherein the step of releasing said temporary covering  
2    comprises pulling a rip cord or ribbon to fail said temporary covering.